

ISS and Human Research Project Office Highlights December 11, 2009

ISS Research Program

CFE-2 SAR-2 held on December 7, 2009

The Executive Systems Assessment Review (or SAR-2) was held on December 7, 2009 for the Capillary Flow Experiments-2 (CFE-2) flight experiment. This review encompassed four experiment units, Vane Gap 1 (VG1), VG2, Interior Corner Flow 1 (ICF1), and ICF2. These units were refurbished from the CFE-1 project and will be re-flown with new vanes (VG1, VG2) and changes to fluid volumes and viscosities (ICF1, ICF2).

The project manager, Donna Bohman, presented an overview of the experiment and the status of the verification and open work items from SAR-1. All verifications, including thermal cycle testing, were completed and closed out since the SAR-1 review on November 23. The project scientist, Bob Green, presented an overview of the CFE-2 science. The mechanical engineering lead, Chuck Bunnell (ZIN), presented an engineering overview of the CFE-2 hardware. In addition, a review and status of the transfer tube crazing issue for the new CFE-2 units was presented. The SAR-2 was well-received by the executive panel; they agreed with the team and SAR-1 panel that the transfer tube crazing issue is not relevant to the re-flight units subject to this review.

The CFE-2 flight experiment consist of 11 handheld experiment units with various test geometries to investigate the behavior of capillary flow phenomena in geometries found in capillary vanes, screens, and wicking structures. The working fluid is silicone oil of various viscosities, depending on the individual unit geometry. The results of CFE-2 have applications in propellant management for fluid storage tanks, thermal control systems, and advanced life support systems for spacecraft. The Principal Investigator for CFE-2 is Professor Mark Weislogel at Portland State University. The CFE-2 flight experiment is funded by the Exploration Technology Development Program (ETDP) under the ISS Research Project. It is scheduled for launch on Flight 19A (STS-131) in March 2010. (POC: RET\Robert D. Green (216) 433-5402)

CFE-2 SAR Held on November 23, 2009.

A Systems Assessment Review (SAR) was held on November 23, 2009, for the Capillary Flow Experiments-2 (CFE-2) flight experiment. This review encompassed four units, Vane Gap 1 (VG1), VG2, Interior Corner Flow 1 (ICF1), and ICF2. These units were refurbished from the CFE-1 project and will be re-flown with new vanes (VG1, VG2) and changes to fluid volumes and viscosities (ICF1, ICF2). The project manager, Donna Bohman, presented an overview of the experiment and reviewed the CFE-2 team's responses to all outstanding Requests for Action (RFAs) from the Critical Design Review (CDR) held in last April. The project scientist, Bob Green, presented an overview of the CFE-2 science. The mechanical engineering lead, Chuck Bunnell (ZIN), presented an overview of the CFE-2 hardware and Wayne Borrelli (ZIN) presented the safety and risk assessments. The SAR was well received by the engineering panel; they noted that thermal cycling testing will need to be completed on all units before the executive SAR (or SAR-2) in 2 weeks. The panel recommended that additional bond strength testing be

performed to confirm that the integrity of acrylic bonds in the five plus year old units is not a concern. The CFE-2 flight experiment consist of 11 handheld modules with various test geometries to investigate the behavior of capillary flow phenomena in geometries found in capillary vanes, screens, and wicking structures. The working fluid is silicone oil of various viscosities, depending on the individual unit geometry. The results of CFE-2 have applications in propellant management for fluid storage tanks, thermal control systems, and advanced life support systems for spacecraft. The Principal Investigator for CFE-2 is Professor Mark Weislogel at Portland State University. The CFE-2 flight experiment is funded by the Exploration Technology Development Program (ETDP) under the ISS Research project. It is scheduled for launch on Flight 19A in March 2010. (POC: RET/Robert D. Green, (216) 433-5402)

CFE-2 PI Visit to Inspect Flight Experiment Units.

The Capillary Flow Experiments 2 (CFE-2) Principal Investigator (PI), Professor Mark Weislogel (Portland State University) and his graduate student, Alex Baker, visited GRC during the week of November 9-13, 2009, to deliver the flight fluid, inspect, and observe the fluid fill of the CFE-2 flight units, Vane Gap 1 (VG1), VG2, Interior Corner Flow 1 (ICF1), and ICF2. The PI inspected the units to determine a number of as-built dimensions that are key to the CFE-2 science. Overall, Dr. Weislogel was pleased with the quality and fabrication of the units. In addition, Dr. Weislogel and his student performed 30+ drops of the CFE-2 Vane Gap engineering unit in the 2.2 Second Drop Tower (Building 45). These tests were performed to collect data on the initial reorientation rates in the vane-wall gap geometry, along with refining the test matrix of critical wetting angles to be provided in the crew procedures for the CFE-2 flight experiment to be performed on ISS in early 2010. This work is funded by the Exploration Technology Development Program (EDMP) under the ISS Research project, and investigates the behavior of capillary flow phenomena in geometries found in capillary vanes, screens, and wicking structures. It has applications in propellant management in fluid storage tanks, thermal control systems, and advanced life support systems for spacecraft. (POC: RET/Robert D. Green, (216) 433-5402)

Additional data for FLEX collected from CIR on ISS.

On November 27, 2009 the Combustion Integrated Rack successfully performed additional data points as part of the Flame Extinguishment Experiment (FLEX). The CIR has a Passive Rack Isolation System (PaRIS) installed that minimizes disturbances to the experiment during operations. The PaRIS system is locked down via four connection points (snubbers) when the CIR is not operating. After completing the last set of data points, one of the snubbers broke when locking down the CIR. The ISS Boeing engineers (PaRIS is a ISS system) have actively worked this issue to assure the CIR is safe during ISS re-boost operations and to determine a go-forward plan. ISS has developed a “work around” procedure and the CIR will resume normal operations next week in the “unlocked” mode. The repair to the broken snubber should be completed in the next couple weeks that will include an install of foam inserts to alleviate the risk of breaking the snubber in the future. CIR test points are scheduled for next week, test point ops on Tuesday and Wednesday, followed by transfer and download on Thursday. (POC: MAH/Bob Corban, (216) 433-6642/J. Mark Hickman, (216) 977-7105)

Glenn Engineer is guest speaker at ASM International Young Members Night.

Kim de Groh was the guest speaker for the Cleveland Chapter of ASM International (the Materials Information Society) annual "Young Members Night." The event was held at the International Women's Air & Space Museum (IWASM) on Tuesday, December 8, 2009. The young member's night is an event organized for high school students, teachers and their parents, and was attended by ASM members. Following a museum tour and buffet dinner, Kim gave a presentation entitled "Materials in Space: Spacecraft Environmental Durability." Kim's presentation included a brief introduction to materials science engineering, an introduction to the space environment and spacecraft environmental durability issues, and then reviewed NASA Glenn's materials environmental exposure spaceflight experiments as part of the Materials International Space Station Experiment (MISSE) program. Kim also talked about Glenn's collaborative efforts with high school students from Hathaway Brown School. After the presentation Kim showed a short video on how astronauts go to the bathroom on the shuttle or space station, as explained by Cleveland astronaut Don Thomas inside the shuttle Crew Compartment Trainer at JSC. Kim was asked to give the presentation at a future meeting of the Akron Chapter of ASM International. This work is supported by the ISS Research Project. (POC: RES/Kim K. de Groh, (216) 433-2297)

Human Research Program

Potential problem in DigitalHuman code found by GRC personnel in simulation of short and moderate term space missions of ground based tests.

On December 1, 2009 Dr. Jerry Myers represented GRC at the monthly Digital Astronaut face-to-face meeting, held this month at the University of Mississippi Medical Center (UMMC) in Jackson, Mississippi. Dr. Myers participated in the review of user community feedback and reported on findings from the GRC verification and validation of UMMC's DigitalHuman code. A chief finding reported by GRC was an unexpectedly long hysteresis and settling period for the code, indicating a potential problem when attempting to simulate short and moderate term space missions of ground based tests. This finding is currently under review by the DigitalHuman development team. (POC: MAH/Jerry Myers, (216) 433-2864)

John Glenn Biomedical Engineering Consortium projects recognized in CWRU publications.

Two projects initially funded by the John Glenn Biomedical Engineering Consortium have been highlighted in recent Case Western Reserve University (CWRU) Publications. The CWRU Annual Report highlighted, as one of only eight areas mentioned, the work funded by the Consortium on a countermeasure to bone loss through the application of micro-cracks to trigger bone growth. This was a collaboration between CWRU, The Cleveland Clinic and GRC. The CWRU "Think" magazine highlighted Consortium funded work on a minimally invasive sliver sensor for monitoring vital electrolyte and metabolite levels in a section entitled "We're Engineering Better Health". It is encouraging to see that this work is continuing to progress well beyond the initial funding the Consortium provided over six years ago. (POC: MAH/Marsha Nall, (216) 433-5374)